and hard, and the skin around livid in colour, there being but little pain and an entire absence of suppuration. If the serum of the vesicles, or of the infiltrated tissue be examined, the bacilli characteristic of splenic fever will be detected. Constitutional symptoms (rigors, headache, depression, a rapid weak pulse, dyspnœa, and collapse) usually come on two or three days after the local signs.

(2) If the affection commence with a small vesicle or pustule, around which firm, extensive œdema of the lip, cheek, nose, or eyelid comes on, which increases and becomes of a livid colour, with the development of fresh pustules and the appearance of sloughs of cellular tissue at the bottom of the pustules, the swelling being attended with very severe pain and febrile symptoms of asthenic character (hot skin, rapid weak pulse, dry tongue, muttering delirium), the disease is *facial* or *malignant carbuncle.* Death is usually preceded by signs of pyæmia, and the plugged facial vein may be felt as a firm cord. Some cases of facial carbuncle do not assume this malignant type.

(3) Gangrene attacking a young child, and beginning as a livid, firm swelling of the gums, or of the mucous surface of the lips or cheeks, on which a grey slough appears, and extends to all the tissues of the part, there being meanwhile a discharge of very fœtid saliva and symptoms of nervous depression, is *cancrum oris.* It is most usually met with in debilitated children, and particularly after the occurrence of measles, or other acute specific disease. It is limited to children, and is frequently fatal. It is to be remarked, that in cancrum oris, the sloughing commences on the mucous surface, and spreads outwards; in charbon it begins in the skin and spreads inwards; in carbuncle it begins in the subcutaneous tissue and spreads out to the skin.

It may happen that a carbuncle in a late stage,

but before the separation of its slough, may rather closely resemble a sloughing gumma; it may be well, therefore, to point out the features by which the two affections may be distinguished. A *sloughing gumma* is a chronic affection commencing in a painless induration, the skin over which slowly ulcerates in one aperture, exposing the slough, which is usually of a yellowish colour; the area of redness around is very slight and narrow. There are other evidences of the syphilitic diathesis; gummata often occur where carbuncles never occur, as in muscular tissue, or around the knee joint. A *carbuncle* is a much more acute and painful affection, commencing as a red, tender, brawny infiltration, the skin over which ulcerates in several parts, exposing a grey slough, which some believe to have a distinctive odour. Carbuncles are most common on the back of the trunk, and in men past middle life.

CHAPTER XXIII.

THE DIAGNOSIS OF DISEASES OF JOINTS AND BURSÆ.

It will be convenient to consider, in the first place, the general principles of diagnosis of articular disease, and then afterwards to refer in detail, where that is necessary, to the diagnosis of affections of individual joints. It is well to indicate at the outset that among joint diseases will be considered not only those affecting the joint cavities with their synovial membranes, ligaments, and cartilages, but also those of the joint ends of the bones; in discussing these we shall have occasion to point out how affections of neighbouring structures, *e.g.* bursæ, may be identified.

In other words, in this chapter an attempt will be made to enable the reader to examine intelligently and purposively, and then to arrive at a correct diagnosis of, any disease of a joint or its immediately surrounding structures; of a "joint" in the popular sense of the term.

A. When such a case presents itself to the surgeon the first fact to be ascertained is whether there is any organic disease of the part, for it must ever be borne in mind that *hysteria* or *neuromimesis* often imitates closely grave articular lesions. The fact upon which such a diagnosis of *hysteria* must rest is the want of correlation of the symptoms; hysteria is more common in women, but not limited to them, or to any age; it is frequently associated with other signs of hysteria, and in many cases may be traced to the influence of some strong emotional disturbance. Where, then, a patient complains of pain in a joint of a very severe character, especially if this be accompanied with marked superficial hyperæsthesia, but there be no discoloration nor heat nor swelling about the part, nor wasting of the muscles of the limb, an *hysterical joint* must be suspected; and if it be found that the joint is held rigid, usually in the position assumed in disease, but sometimes strikingly different, as *e.g.* in the position of extreme extension, and that all attempts to move it excite spasms of the muscles and cries from the patient, but that when the attention is diverted passive movement can be made without difficulty or pain, or that the patient herself moves the part, this suspicion becomes converted into a positive diagnosis. In cases where the surgeon remains in doubt the history of some strong emotion or the witnessing of a case of real joint disease just before the onset of the illness, or the presence of other hysterical phenomena, will be of assistance; and it may be useful to place the patient under the influence of chloroform and to

examine then with care the outline and mobility of the joint, and particularly to notice when the joint becomes rigid, for it is stated that in neuromimesis the rigidity only reappears when the patient's consciousness returns, while in painful organic disease it comes on as soon as the deep anæsthesia passes off. Slight ill-defined general swelling may be met with as the result of the use of stimulating liniments; and in some cases of long-standing, slight wasting of the muscles may be observed, but this is never so marked as in cases of organic disease.

Having determined that there is organic disease of the part, the surgeon must next ask himself where that disease is situated, and *what structures are involved*. This is mainly determined by the position and outline of any swelling present, the character and degree of interference with the function of the joint, and the seat, character, and mode of causation of pain. Where swellings are found which correspond in outline to some neighbouring structure as a bursa or synovial sheath, and not to the articular cavity or any of its bones, and if at the same time there is no alteration in the mobility of the joint or pain produced by it unless it excite it in the inflamed structure outside, it will be at once known that the disease is extra-articular; such cases are constantly seen in housemaid's knee, miner's elbow, teno-synovitis of the wrist or ankle, etc. On the other hand, where a swelling does correspond in outline to the synovial cavity of a joint, or to one of the articular bones, or where the motion of a joint has lost its smoothness, or is painful, or the articular bones are found sensitive to pressure or shocks transmitted through them, it may be judged that the actual joint structures are involved. We must now consider this matter a little more fully. Owing to the frequency of diseases of the synovial membrane, it is best, in the first place, to examine that structure, and then the cartilages,

ligaments, and the articular bones, and, lastly, the structures around the joint.

(1) Where the outline of the swelling corresponds to the synovial cavity, or gentle even movement of the joint is painful, the disease may be considered to be affecting the *synovial membrane.*

(2) Where the articulation always assumes one particular position, any alteration of which is painful and is resisted, or where the natural relation of the bones is seriously altered, as in subluxation backwards of the knee, or the outline of the synovial cavity is altered; or, again, where abnormal mobility is possible, the disease has affected the *ligaments* of the joint; in some cases a consideration of the symptoms will enable the surgeon to localise the lesion in a particular ligament.

(3) Where the movement of the joint has lost its usual smoothness and is accompanied by hard grating or a soft rubbing or a crackling sensation, or where the patient experiences severe "starting pains" in the part, especially just as he is falling off to sleep, or, again, where nodular growths can be felt springing from the edge of the articulated cartilage, the disease is known to be affecting the *cartilage.*

(4) If the articular bone or bones be found swelled, and tender on pressure, and if pain be excited by force transmitted along them, or if the patient complain of a deep aching or gnawing pain in the part, worse at night, it will be known that the *articular bone* is diseased.

(5) If a swelling correspond in position and outline to a bursal cavity, or there be soft friction felt on movement of the walls of a bursa over one another, while the neighbouring joint is at rest, it will be evident that the disease is in a bursa.

(6) And where a swelling corresponds in position or outline to a tendinous synovial sheath, or pain and

soft grating are elicited by movement of a particular muscle or muscles, while the joint is kept at rest (where this is possible) the diagnosis of disease of a *synovial sheath* is obvious.

(7) Lastly, a swelling or other morbid phenomenon may not correspond with any special structure, but may involve the common connective tissue of the part.

Many joint diseases affect more than one of the above structures, either primarily or in succession, and in the latter case it may be impossible to tell where the disease originated; but wherever it is possible, and certainly in all cases early in the disease, a careful attempt to localise the affection will usually be attended with success.

B. The surgeon must next determine the *nature of the affection* present. Inflammation in its various forms is the most frequent disease, and its symptoms are like those observed in other situations. Degenerations and neoplasms are also met with.

THE DISEASE IS ACUTE,

(1) If, immediately after a severe strain or wrench, or following a fracture into a joint, the synovial cavity be found distended and fluctuating, and especially if the skin show any signs of bruising or blood-staining, and be not hot, nor the joint acutely tender, the diagnosis of *hæmarthrus*, or effusion of blood into the synovial cavity, should be made. Unless the case is seen early this diagnosis cannot be attempted, as it is only by the time of occurrence of the swelling that we are able to distinguish with certainty between effusions of blood and of serum, and in many cases the one is followed by and associated with the other.

(2) If the synovial cavity of a joint be found distended with fluid which has been secreted rapidly, and the part be hot and tender, with perhaps slight redness of the skin, while the patient complains of constant

throbbing pain, any movement of the joint causing acute pain, the general temperature being also raised, the disease will be recognised as *acute synovitis.*

(3) If the symptoms continue, and the swelling increase, the superficial structures become œdematous, and the skin assume a dull red colour, the local heat is more marked, and the general pyrexia increases, and especially if there be a rigor, *pyarthrus*, or pus in the joint is to be diagnosed. As there is no sharp line between the usual inflammatory effusion and pus we are unable to mark the precise onset of suppuration; wherever the symptoms lead the surgeon to suspect it, he should resort to exploratory puncture and an examination of the contents of the joint. This may be repeated from day to day if necessary.

(4) Where a similar distension of the synovial membrane with fluid is found, but there is no redness, and little or no heat of the skin, and no tenderness, while the pain in the part and on moving it is less marked, and there is no general fever, but the disease is of recent origin, it will be distinguished as *subacute synovitis.*

(5) If a synovial effusion develop very rapidly, and quickly run on to suppuration with destruction of the articular cartilage as shown by the presence of bony grating on moving the joint, and this be accompanied by high fever and a rigor or rigors, the diagnosis of *pyæmic synovitis* may be arrived at. This will be confirmed by the other signs of pyæmia (*see* page 67), by the fact that several joints are successively affected, by the comparative painlessness of the affection, and the presence of a bright red blush over the joint.

(6) If several joints are simultaneously or successively attacked with moderate, general, ill-defined swelling, acute pain especially on any movement, moderate tenderness of the joint and superficial heat

and redness, and if there be acute pyrexia, profuse sour-smelling perspiration, concentrated acid urine, a coated tongue, and particularly if there be pericarditis, endocarditis or pleurisy, or a history of previous attacks, the surgeon will recognise the joint affection as a part of *acute articular rheumatism.* The number of joints affected, the rapid onset and subsidence of the local lesions, the character of the general disturbance, and the history of previous attacks are the main points on which to found a diagnosis.

(7) If a joint or joints become inflamed after either of the acute specific fevers, or during the course of an attack of gonorrhœa or gleet, the part being swelled, hot, very painful, and the general temperature raised, it is regarded as a form of *subacute pyæmia.* That associated with gonorrhœa is known as *gonorrhœal rheumatism*, it may attack one or many joints, and other than articular synovial membranes.

(8) If a patient be seized in the night with a very severe pain in a joint which in a few hours becomes swelled, with a red glossy appearance of the skin over it, and œdema of the subcutaneous tissue, the part being exquisitely tender, and the temperature moderately raised, it will be recognised as *acute gout.* This diagnosis will be confirmed if the affected joint be the metatarso-phalangeal, if previous similar attacks have occurred and particularly in that joint, and if there be other evidences of gout such as tophi, dyspepsia, cramps, family history, or by a demonstration of excess of uric acid in the blood.

(9) If the joint end of a bone of an infant or young child become acutely swelled, painful, and very tender, the soft parts over it being swollen, but careful movement of the joint is found not to give acute pain; and further, if fluctuation be subsequently detected close to, but not in, the synovial cavity, or the epiphysis of the bone be found movable upon the

diaphysis, the disease is *acute epiphysitis;* inquiry must then be directed towards obtaining a history of a blow, or of congenital syphilis.

If there be a fluctuating swelling in the position of a bursa, with great pain, tenderness and redness of the skin and general pyrexia, it may be diagnosed as *acute bursitis;* and if the surrounding tissues become œdematous, the pain throbbing in character and the temperature still more raised and variable during the day, it indicates that *suppuration* has occurred. This affection is most frequently seen in the bursa over the patella, or in that over the olecranon or in a bunion, generally as the result of a wound or some other injury.

If the patient complain of sharp pricking pain in the site of a bursa, and it be found tender on pressure and yielding soft crepitus or friction when the part is so pressed or moved as to glide the two surfaces of the bursa over one another, it is to be recognised as *subacute plastic or dry bursitis.* This is seen most often and is most readily diagnosed in the prepatellar bursa.

THE DISEASE IS CHRONIC.

(1) Where the synovial cavity is found distended with fluid, and the part is neither reddened, hot, nor painful, the only subjective symptoms being a sense of weakness, and some limitation of movement, and if this be a very chronic affection it is known as *hydrarthrus* or dropsy of the joint.

(2) Where there is a small amount of fluid in the synovial cavity, and this part is found to be somewhat thickened, and the limitation of the movement of the joint is more than is accounted for by the amount of effusion, while there is no local heat, redness, or tenderness, it is known as *simple chronic synovitis.*

(3) If there is found an ill-defined elastic swelling of a joint, giving it a more or less even globular outline, and if there be some heat of skin, but no redness, and the part be rigidly fixed, in a position of semiflexion usually, and any movement be resisted and is painful, and pressure over the articular ends of the bones or of the two bones against each other is painful, while the muscles of the part are flabby and wasted, the patient being pale, anæmic and showing perhaps other evidences of struma, the disease is *chronic strumous arthritis* or *white swelling* of the joint. There may be softening or fluctuating parts of the swelling, or sinuses leading down to carious or necrosed bone, or the pains pointing to ulceration of cartilage, or the grating sensation on moving the joint characteristic of exposure of the joint ends of the bones; all these but confirm the diagnosis. This disease may originate in the synovial membrane or in the epiphyses; it may affect the various structures of the joint to very different degrees, and progress very slowly or more rapidly, and towards recovery or towards destruction of the articulation. Hence the actual phenomena of the disease differ considerably in a series of cases. The signs by which it may be decided whether the disease, if commencing, is attacking the synovial membrane or the epiphyses of the bones have been stated above (page 356).

(4) If a joint slowly and almost painlessly become enlarged and stiffened, and on examination there be found a brawny ill-defined thickening of the ligaments and the soft parts over the joint, with firm nodular projections which can be felt as such moving over the cartilages almost like loose bodies, and especially if there be any ulceration of this indurated tissue, or cicatrices of old syphilitic ulcers, or a history or other evidence of syphilis congenital or acquired, the disease is *syphilitic gummatous arthritis.* When the infiltration is well marked there is usually considerable synovial effusion. Pains in

joints between the appearance of an indurated chancre and the secondary eruption may be attributed to syphilis. And synovial effusion appearing in a joint without any injury during the secondary stage of syphilis is also to be recognised as *syphilitic synovitis.*

(5) If a patient generally about or past middle life complain of more or less constant wearing aching pain, and of some stiffness or a sense of weakness and insecurity in a joint, these symptoms being usually worse in cold damp weather, but not sufficiently so for the disease to be called intermittent or to consist of successive attacks, and on examination the surgeon detect dry creaking or crackling on passive movement, and firm nodular outgrowths from the edge of the joint surfaces, he will diagnose *arthritis deformans.* This disease may occur in young delicate persons; it may attack one or many joints, thus it is often limited to one hip or knee, or is seen involving many of the small joints of the hands, where the nodular outgrowths from the bones are very evident. Occasionally joints affected with this disease break down and suppurate, the soft parts become swelled and boggy with dusky redness of the skin over them, and an abscess bursts discharging cheesy or curdy material. A disease closely simulating if not identical with this has been described by Charcot as occurring in locomotor ataxy and is now known as *Charcot's disease of joints* or *ataxic arthropathy.* There is usually considerable effusion, rapid and great absorption of the articular bones, no or very little growth of osteophytes, and singular freedom from pain; the onset of the disease is more acute and its course is usually more rapid than is that of common arthritis deformans. The absence of the patellar reflex, the occurrence of lightning pains in the limbs, the failure of the pupil to contract under the

stimulus of light while it contracts when the eyes converge, and the characteristic gait, will enable these cases to be recognised; "gastric crises" are common in the patients with this disease.

(6) If the patient have experienced several attacks of acute pain, tenderness and swelling of a joint or joints, and the part be found permanently enlarged with a smooth or nodular deposit around it, either fixed to the bones or movable over them, and the joint be found either anchylosed or moving without creaking or grating, and especially if this disease be hereditary, have occurred solely or first in the joints of the great toe, or the heel or ankle, and if there be other signs of gout as tophi, rigid arteries, dyspepsia, with excess of uric acid in the blood, it is *chronic gout.* The position of the disease, its onset by successive acute or subacute attacks, the character of the "chalk-stones" and the other evidences of gout distinguish this from arthritis deformans; it is much more common in men than women.

(7) For the diagnosis of sarcoma of epiphyses of bones *see* page 317. A soft sarcoma springing from a bone may burst through into the synovial cavity and fill it out, and so simulate synovitis; the diagnosis will rest upon the swelling not being limited to the joint cavity, by its constant growth, and by a puncture yielding only blood; later on by ulceration of the skin, fungus, etc.

(8) If, during movement of a joint, it become locked in the flexed position, with intense sickening pain, the presence of a *loose body in the joint* must be suspected; and if the attacks recur from time to time, while under some sudden passive movement both the pain and the immobility abruptly pass off, and particularly if the "body" can be felt moving within the synovial cavity, the diagnosis becomes certain. In some cases the "loose body" is felt by the patient and

the surgeon, and the diagnosis is made previous to its slipping between the bone and causing the severe pain. If the "body" be always found at the same part of the joint, and cannot be moved freely to all parts of the cavity, it may be considered as still attached by a pedicle of synovial membrane.

A fluctuating tumour occupying the position of a bursa, with no local heat or redness of the skin, and but slight pain, and no tenderness or pyrexia, is to be diagnosed as *chronic serous bursitis.*

If at the site of a bursa a small firm rounded or oval nodular body can be felt, movable under the skin and over the subjacent bone, it may be diagnosed as a *pendulous growth in the bursa.* These can be diagnosed when they occur in the prepatellar bursa.

A tense globular fluctuating cyst, not adherent to the skin, but found to be adherent to a synovial sheath, or to a joint, or to be reducible into a joint by gentle continuous pressure, is a *synovial cyst.* These are most common over the back of the hand and dorsum of the foot; but they are also met with in connection with other joints and synovial membranes.

C. In this section will be considered the special features of the diseases of individual joints. For *disease of the temporo-maxillary joint, see* chapter xxviii.

(1) **Shoulder joint.**—Owing to the deep position of the joint, distension of its synovial cavity does not give rise to a fluctuating swelling, and only in some cases can a soft elastic or fluctuating protrusion be felt in the axilla; but in *acute synovitis* the joint is held fixed, and the prominence of the shoulder is somewhat increased. In *dropsy* of this joint the arm may be lengthened, and the head of the humerus can be pushed up into its proper place, and then felt to fall again.

Where the prominence of the shoulder is considerably increased, and fluctuation is detected through the

deltoid muscle, or from its anterior to its posterior border, while the joint is not fixed, nor its movement painful provided that the limb is kept abducted to relax the deltoid muscle, the surgeon will diagnose *effusion into the bursa beneath the deltoid.*

(2) **Elbow joint.**—Distension of the synovial cavity is most apparent on the outer side of the olecranon and over the head of the radius; sometimes it causes the obliteration of the space between the olecranon and the inner condyle of the humerus, or bulging above the olecranon.

The ease with which each of the three bones entering into this joint can be felt renders the detection of disease limited to one or other of them comparatively easy. The only *bursa* in this situation liable to be inflamed is one placed over the tip of the olecranon under the skin; effusion into it causes a swelling in the middle line of the joint behind, obscuring the olecranon, instead of on each side of that bone as in synovitis.

For disease of the *wrist joint, see* chapter xliii.

The hip.—The hip joint lies so deep and is so well protected by thick masses of muscle that the outline of its capsule cannot be defined, and distension of its synovial cavity causes nothing more than a slight ill-defined fulness in the fold of the groin, and occasionally in very thin subjects a soft or even fluctuating swelling behind the great trochanter of the femur. The limb is at the same time held flexed, abducted and rotated out. The diagnosis of disease of the hip and of the affections for which it may be mistaken is a matter of great importance, and must be considered in some detail.

The patient should always be examined lying flat on his back, on a firm mattress, with the lower limbs extended, and care should be taken to have the pelvis